As will be appreciated by those skilled in the art, microprocessor **42** can be programmed to monitor the frequency of occurrences of eyelid movements over any number of different time periods within the finite range of the short term buffer and can provide different output signals depending on the frequency found. The frequencies and time periods can be determined during clinical studies on several or a single subject and input to the system before use. The programmed frequencies and time periods programmed to trigger output signals may correspond to different stages of vigilance loss.

It will be understood by those skilled in the art that various changes and modifications to the embodiments shown in the drawings and described above can be made within the scope of the invention. For example, the particular circuitry for receiving the electrical signal has been described as analog circuitry. It should be understood that digital circuitry would also be suitable for such purpose. Additionally, short term buffer **52** was shown and described as a finite length digital buffer. Other memory storage elements would be suitable. Any type of output signal provided by microprocessor including, but not limited to, audio alarm signals, signals provided to a central computer, signals provided to a distant headquarters or monitoring area, or other, would be suitable. The microprocessor **42** is adaptable and programmable.

In addition, while the sensor shown and described included a piezoelectric film, any other sensor that is capable of producing accurate and detectible voltages in response to small active eyelid movements is suitable. Accordingly, the foregoing is intended only by way of example and should not otherwise limit the scope of the invention. Rather, these and all other equivalents are expected to be encompassed by the following claims.

What is claimed is:

1. A vigilance monitoring system comprising:

a sensor, attached to the eyelid of a subject, that produces an electric signal in response to each eyelid movement, wherein the strength of the signal depends on the magnitude of the eyelid movement; and

a processor, electrically coupled to the sensor, that monitors the frequency of electric signals received having a signal strength above a threshold level corresponding to a small active eyelid movement, and produces an output signal if the frequency of received electric signals having the signal strength is less than a predetermined frequency.

2. A vigilance monitoring system as claimed in claim **1** wherein the sensor is made from a piezoelectric material.

3. A vigilance monitoring system as claimed in claim **1** wherein the output signal includes an audio alarm signal provided to an output loudspeaker.

4. A vigilance monitoring system as claimed in claim **1** wherein the processor includes a signal recording circuit and a programmable microprocessor, the signal recording circuit being electrically connected between the sensor and the microprocessor.

5. A vigilance monitoring system comprising:

a sensor, attached to the eyelid of a subject, that produces an electric signal in response to each eyelid movement, wherein the strength of the signal depends on the magnitude of the eyelid movement; and

a processor, electrically coupled to the sensor, that monitors the frequency of electric signals received having a signal strength above the threshold level corresponding to a small active eyelid movement, and produces an output signal if the frequency of received electric signals having the signal strength is less than a predetermined frequency, wherein the processors includes a signal recording circuit and a programmable microprocessor, the signal recording circuit being electrically connected between the sensor and the microprocessor, wherein the signal recording circuit includes:

a peak detection circuit, coupled to the sensor, that stores the highest strength electric signal received during each predetermined time period;

a comparator, coupled to the peak detection circuit, that compares the highest strength electric signal to a threshold level signal during each predetermined time period; and

a short term event buffer, coupled to the microprocessor and comparator, having a number of address locations, each address location corresponding to a separate time period and temporarily storing a number representing whether an electric signal having the signal strength greater than the threshold level was received during a corresponding time period.

6. A vigilance monitoring system as claimed in claim **5** wherein the microprocessor is programmed to produce a first output signal if the frequency of received signals having the signal strength is less than a first predetermined frequency and to produce a second output signal if the frequency of received signals having the signal strength is less than a second predetermined frequency.

7. A vigilance monitoring system as claimed in claim **5** wherein the predetermined time period is approximately equal to 250 ms.

8. A vigilance monitoring system comprising:

a sensor, attached to the eyelid of a subject, that produces an electric signal in response to each eyelid movement, wherein the strength of the signal depends on the magnitude of the eyelid movement; and

a processor, electrically coupled to the sensor, that monitors the frequency of electric signals received having a signal strength above the threshold level corresponding to a small active eyelid movement, and produces an output signal if the frequency of received electric signals having the signal strength is less than a predetermined frequency, wherein the processors includes a signal recording circuit and a programmable microprocessor, the signal recording circuit being electrically connected between the sensor and the microprocessor, wherein the microprocessor is programmed to produce a first output signal if the frequency of received signals having the signal strength is less than a first predetermined frequency and to produce a second output signal if the frequency of received signals having the signal strength is less than a second predetermined frequency.

9. A method for monitoring vigilance of a subject comprising the steps of:

using a sensor, attached to the eyelid of the subject, to produce an electric signal in response to each eyelid movement, wherein the strength of the signal depends on the magnitude of the eyelid movement;

monitoring the frequency of electric signals produced having a signal strength above a threshold level corresponding to a small active eyelid movement; and

producing an output signal if the frequency of produced electric signals having the signal strength is less than a predetermined frequency.

10. The method as claimed in claim **9** wherein the step of using a sensor includes the step of using a piezoelectric sensor.